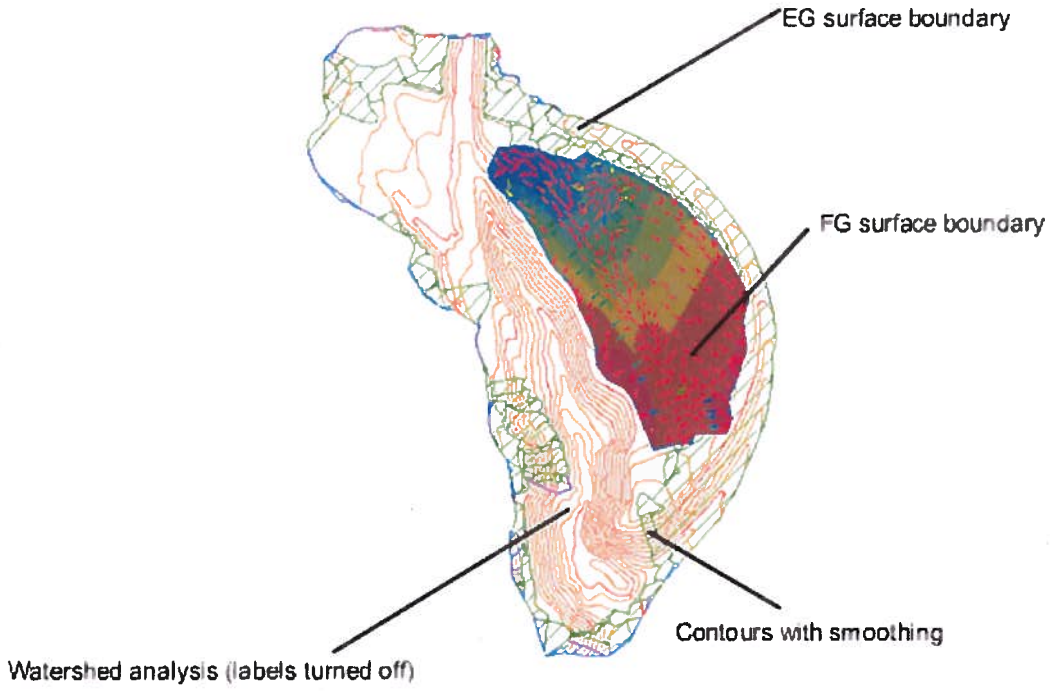
Appendix D

AutoCAD Civil 3D 2010 Information

Surfaces

You can work with two types of surfaces: TIN (triangulated irregular network) and grid. For each of these types, you can create volume surfaces, which are differential surfaces created from two existing surfaces. Surface styles define the appearance of any surface. They can also be used to control the visibility of any analysis that has been performed on that surface. Watersheds can be drawn on the surface, with information about the type of drainage area and where each area drains to.

Boundaries define the visible area of a surface. Only the area within the boundary is included in calculations, such as for total area and volume. You can also define masks to hide or show parts of a surface for editing or presentation purposes, while still including that area in calculations.

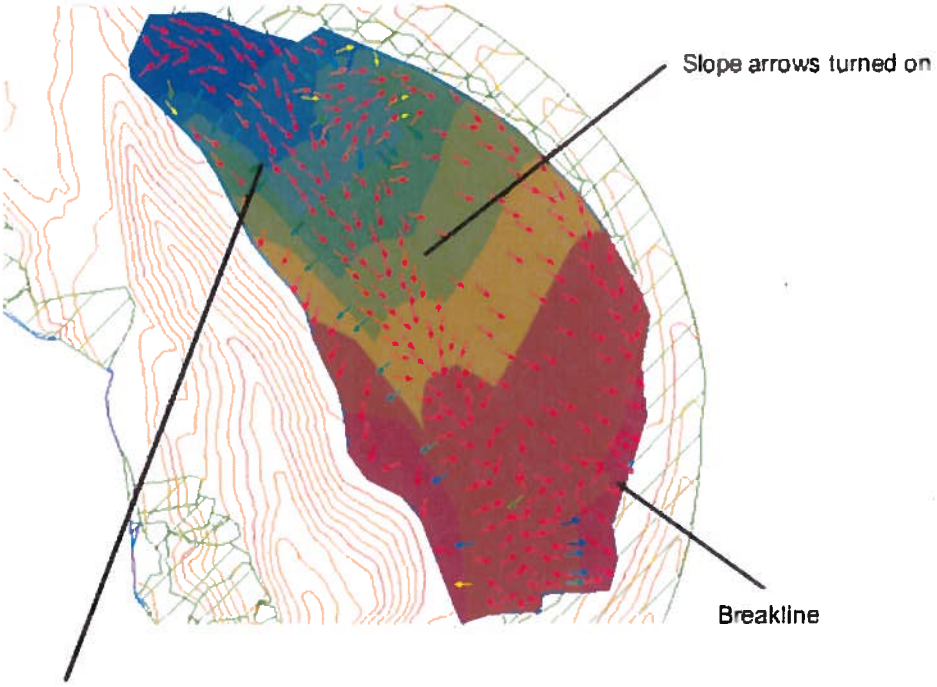


Surfaces displaying boundaries, contours, and elevation analysis

Breaklines are used on TIN surfaces to define linear features that triangles cannot cross, such as retaining walls or streams. Breaklines affect triangulation of the surface.

You can define different sets of contours, for example, for different intervals. Smoothing is provided for the surface object as a whole, which gives better results than simply smoothing the contours. In AutoCAD Civil 3D, the build process for surfaces is incremental. Whenever data is added or corrected, the surface is updated. Each surface has a definition list. This list contains all the operations performed on the surface. By turning the operations on and off,

you can return a surface to a previous state or modify it to support different types of analysis.



Elevation analysis (colored 3D faces)

Surfaces displaying slope arrows elevation analysis

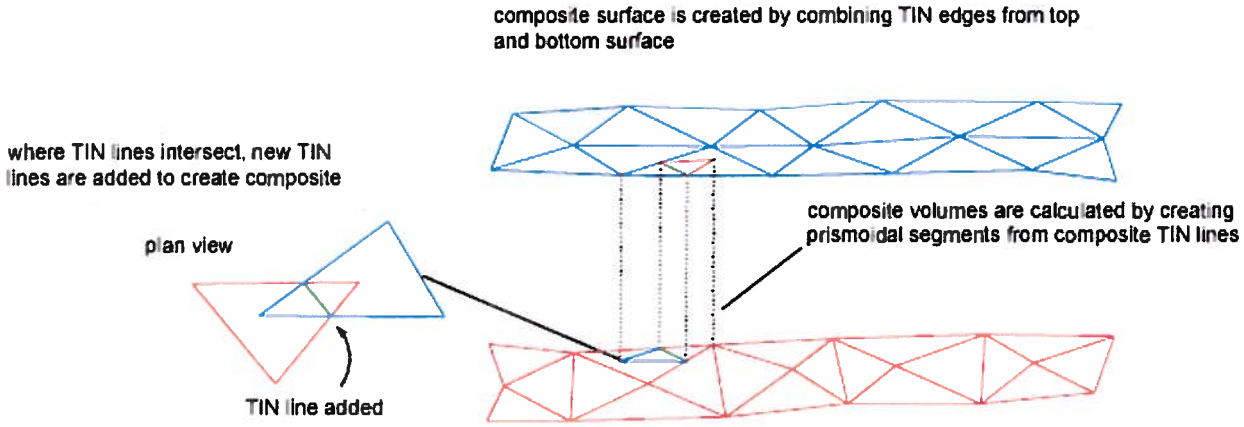
For information about....	See...
Working with Surfaces	Surfaces and Surfaces Dialog Boxes
Workflow	Surfaces Workflow
Tutorials	Surfaces Tutorials
Best Practices	Surface Data

Calculating Composite Volumes

Calculate volumes using the composite method, which triangulates a new surface, based on points from both surfaces.

This method uses the points from both surfaces, as well as any location where the edges of the triangles between the two surfaces intersect to create prismoidal segments from composite TIN lines.

The new composite surface elevations are calculated based on the difference between the elevations of the two surfaces, as follows:



This method gives accurate volume measurements between the two surface definitions.

See Also

- Creating a TIN Volume Surface
- Creating a Grid Volume Surface

Tutorial Exercise: Creating a Composite Volume Calculation

Calculating Composite Volumes

To calculate composite surface volumes

1. Open, create, or import the TIN or grid surfaces for which you want to measure the composite volume. See Creating Surfaces.

   Note The Composite Volumes utility compares two surfaces (surface pairs), so you must have two surfaces available in your drawing.

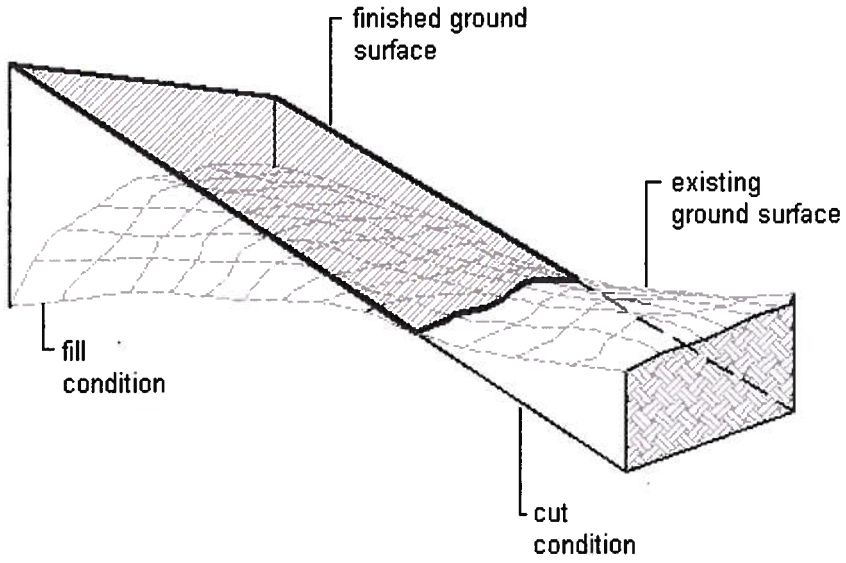
2. Click Analyze tab ➤ Volumes and Materials panel ➤ Volumes drop-down ➤ Volumes .

3. Do one of the following:

   - In the Composite Volumes vista, click and select the surfaces to compare by clicking the <select surface> entry from the Base Surface and Comparison Surface columns (for the base and comparison surfaces respectively).
   - In the Composite Volumes vista, click and select both the base and comparison surfaces from the drawing area.

   After you select the surfaces, the volumes are calculated and the following information is displayed:

   - **Cut**. The amount of material that has to be removed.
   - **Fill**. The amount of material that has to be added.



   - **Net**. The difference between the cut and the fill. For example, if a volume is 200 m3 of cut and 100 m3 of fill, the net is 100 m3 <cut>.

- **Net Graph**. A graphical percentage representation of the whole volume. A fill net is displayed as a green bar indicating that material needs to be added to the project site. A cut net is displayed as a red bar, indicating that material must be removed.

Creating a TIN Volume Surface

A TIN volume surface is a composite of points in a base surface and comparison surface.

A TIN volume surface provides an exact difference between the base and comparison surfaces. Therefore, the Z-value of any point in the volume surface is precisely the difference between the Z of the comparison surface at that point and the base surface at that point. This is true whether the comparison and base surfaces are both grid surface, both TIN surfaces, or one of each.

A volume surface is a persistent surface object. Therefore, you can display cut and fill contours, cut and fill points, and add labels to it. You can view volume properties (cut, fill, net) of a volume surface by selecting Surface Properties. For more information, see Editing and Viewing the Surface Definition.

If you want only to query and obtain information about a surface volume or bounded volume, use the Volumes and Bounded Volumes utilities.

See Also

- Calculating Surface Volumes

Tutorial Exercise: Creating a TIN Volume Surface

Creating a TIN Volume Surface

To create a TIN volume surface

1. Click Home tab ➤ Create Ground Data panel ➤ Surfaces drop-down ➤ Create Surface .

   In the Create Surface, in the Type list, select TIN Volume Surface.

2. Click to select a layer. For more information about layers, see Object Layer Dialog Box.
   Note If you do not select a layer, the surface is placed on the current layer.

3. In the properties grid, click the Value column for the Name property and enter a name for the surface.
   Note To name the surface, click its default name and enter a new name, or use the name template. For more information, see Name Template Dialog Box.

4. To change the style for the surface, click the Style property in the properties grid and click in the Value column.

   The Select Surface Style dialog box is displayed. For more information, see Surface Styles and Visualization.

5. To change the render material for the surface, click the Render Material property in the properties grid and click in the Value column.

   The Select Render Material dialog box is displayed. For more information, see Applying Render Materials to Objects

6. Click the Base Surface property to select the base (bottom) surface. Enter the surface name or click to open the Select Base Surface dialog box where you can select the surface in the list.
   Note Select a surface in the drawing by clicking and following the instructions at the command line.

7. Click the Comparison Surface property to select the comparison (top) surface. Enter the surface name or click to open the Select Comparison Surface dialog box where you can select the surface in the list.
   Note Select a surface in the drawing by clicking and following the instructions at the command line.

8. Click OK to create the surface.

   The surface name is displayed under the Surfaces collection in the Prospector tree. For information about adding data to the surface, see Adding and Editing Surface Data.